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5.3.4.3 Proposed PM/PM_{10}/$PM_{2.5}$ BACT Emissions Limit (Steps 4 and 5)

PM/PM_{10}/$PM_{2.5}$ emissions from CTs are dependent on several factors: one, the manufacturer and model of the CT; two, the sulfur content of the fuel; and three, the use of a postcombustion SCR and/or oxidation catalyst control system. While an SCR and oxidation catalyst controls other pollutants, their use and the introduction of ammonia can increase PM/PM_{10}/$PM_{2.5}$ emissions. In addition, some PM/PM_{10}/$PM_{2.5}$ emissions rates are expressed in terms of filterable particulates only, and some are expressed in terms of filterable and condensable particulates. Therefore, it is difficult to compare PM/PM_{10}/$PM_{2.5}$ emissions rates between facilities as different CT manufacturers, different natural gas sulfur content, and different assumptions used in calculating the conversion of ammonia to ammonium sulfates affects the PM/PM_{10}/$PM_{2.5}$ emissions rate.

The proposed PM/PM_{10}/$PM_{2.5}$ BACT for the two CTs/HRSGs is the exclusive use of pipeline-quality natural gas as the primary fuel.

5.3.5 BACT for H_2SO_4

5.3.5.1 Available H_2SO_4 Control Technologies (Step 1)

There are no postcombustion control systems, such as scrubbers or duct sorbent injection, for H_2SO_4 emissions that have been applied to CTs.

5.3.5.2 H_2SO_4 BACT Technical Feasibility (Steps 2 and 3)

There are no postcombustion control systems that are technically feasible to control H_2SO_4 emissions from CTs.

5.3.5.3 Proposed H_2SO_4 BACT Emissions Limit (Steps 4 and 5)

Only two nondraft BACT determinations for H_2SO_4 expressed as mass per heat input were identified in the RBLC database (see Appendix C, Table C-5). These were 0.0001 lb/MMBtu for the Warren County Power Plant in Virginia and 0.0004 lb/MMBtu for the Caithnes Bellport Energy Center in New York. The majority of the BACT determinations list use of low-sulfur natural gas as the control method.

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C4GT proposes the exclusive use of pipeline-quality natural gas in the CTs/HRSGs as BACT for H_2SO_4.

5.3.6 BACT for GHG Emissions

On June 3, 2010, EPA published a final rule (effective August 2, 2010) in the Federal Register (75 FR 106) entitled PSD and Title V GHG Tailoring Rule, commonly referred to as the Tailoring Rule. For PSD/Title V purposes, GHGs are a single air pollutant defined as the aggregate group of CO_2, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and SF_6. This final rule established specific applicability thresholds for GHG emissions for new major sources and modifications to existing major sources under the PSD and Title V programs. This was necessary, because applying the previous PSD and Title V applicability thresholds of 100 and 250 tpy to GHG emissions would have resulted in a large number of relatively small sources becoming subject to these regulatory programs.

Effective January 2, 2011, a new source or modification, that is a new major stationary source for an NSR pollutant other than GHG, whose GHG emissions exceed 75,000 tpy CO_2e will be subject to PSD review, including a BACT analysis for GHG emissions. CO_2e emissions are defined as the sum of the mass emissions of each individual GHG adjusted for its respective global warming potential using Table A-1 of the GHG Reporting Program (40 CFR 98, Subpart A). Effective July 1, 2011, in addition to this major stationary source applicability criterion, a new stationary source that emits more than 100,000 tpy of CO_2e or an existing source that has the potential to emit 100,000 tpy of CO_2e or greater and commences a modification that results in an emissions increase of 75,000 tpy of CO_2e or greater will be subject to PSD and Title V programs.

The Project will be a new major stationary source for an NSR pollutant other than GHG and will have CO_2e emissions greater than 75,000 tpy. Therefore, the Project will be subject to PSD review for GHG, including a BACT analysis effective January 2, 2011.

In March 2011, EPA published an updated version of the guidance document entitled PSD and Title V Permitting Guidance for Greenhouse Gases (EPA, 2011a). This guidance document, which was originally published in November 2010, provides, among other issues, guidance on performing BACT analyses for GHG emissions. EPA's guidance reaffirms that a BACT analysis for GHG emissions must be conducted using the same five-step, top-down approach used for other NSR pollutants.

The following subsections provide the BACT analysis for GHG emissions required for the project.

The CT/HRSG will be the predominate source of GHGs emitted by the proposed project. The following describes the five-step BACT analysis performed for the CTs/HRSGs.

Step 1 of the top-down BACT analysis is the identification of available control technologies or techniques, including inherently lower-emitting processes/practices/designs, add-on controls, and a combination of inherently lower-emitting processes/practices and add-on controls, that have a practical application to the control of GHG emissions. These control technologies must include control technologies for the pollutant under evaluation, GHG, regardless of the source category type. For example, control technologies must be identified not only for those demonstrated on other combined-cycle CT facilities but also for control technologies determined through technology transfer that are applied to source categories with similar exhaust stream characteristics.

Technologies that formed the basis of an applicable NSPS should also be considered in the BACT analysis, since a BACT emissions limit cannot be less stringent than an applicable NSPS emissions limit.

On August 3, 2015, EPA proposed a federal plan to implement emissions guidelines for power plants under Section 111(d) of the CAA, known as the Clean Power Plan. On that date, EPA also finalized GHG NSPS, which are codified in 40 CFR 60, Subpart TTTT, for newly constructed, modified, and reconstructed utility steam electric generating units. The final NSPS apply to new electric generating units constructed after the date of publication of the proposed standards, June 18, 2014. NSPS define the best system of emissions reduction and standards of performance for newly constructed base load natural gas-fired, combined-cycle CTs as follows:

- Best system of emissions reduction equal to efficient natural gas-fired, combined-cycle technology for base load natural gas fired units.
- CO_2 emissions rate standards of 1,000 lb/MWh gross or 1,030 lb/MWh net.

It is important to note and must be emphasized that available control technologies should not include inherently lower-emitting processes, practices, or designs that would fundamentally redefine the nature of the proposed project or source. A BACT analysis should not consider those control technologies that would change or redefine that applicant's goal, objectives, purpose, or basic design. A BACT analysis may consider control technologies that change *aspects* of the proposed facility but do not redefine the *nature* of the proposed facility.

The plant configuration consists of two CTs/HRSGs in a 2×1, combined-cycle configuration. The analysis has determined that BACT for GHG emissions consists of maintaining a high-efficiency plant design inherent to this type of gas-fired power plant. A GHG BACT permit condition will be proposed that sets a net heat rate limit (equivalent to an efficiency limit) of British thermal units per kilowatt-hour (Btu/kWh), a heat rate appropriate to the proposed combination of gas turbine, HRSG, and steam turbine models. The Btu/kWh net heat rate will be based on the average of the heat rates associated with the primary plant operating mode, i.e., base load operation combusting natural gas with supplemental duct firing. This primary plant operating mode accounts for the majority of the total operating hours of the facility. Small degradation factors will also be applied to account for a design margin, performance degradation of the CT, and degradation of auxiliary equipment between major equipment overhauls. An emissions rate based on electrical output (i.e., lb/MWh CO_2) will also be proposed.

5.3.6.1 Available GHG Control Technologies (Step 1)

CT Energy Efficiency Designs, Practices, and Procedures

CT Design

CO_2 is a product of combustion of fuel containing carbon, which is inherent in any power generation technology using fossil fuel. The basic theoretical combustion equation for methane (CH_4) is:

$$CH_4 + 2\ O_2 = CO_2 + 2H_2O$$

CO_2 emissions are the essential product of the chemical reaction between the fuel and the oxygen in which it burns, not a byproduct caused by imperfect combustion. Therefore, CO_2 emissions cannot be reduced by improving the combustion efficiency, and there is no technology available that can reduce CO_2 generation from the combustion of carbon-based fuels. The only effective means to minimize the amount of CO_2 generated by a fuel-burning power plant is through high-efficiency combustion and plant design resulting in the lowest heat rate in units of Btu/kWh. Minimizing the amount of fuel required (in units of million British thermal units) to produce a given amount of electrical power output (in units of kilowatt-hours) results in the lowest amount of CO_2 generated during the combustion process.

The most efficient way to generate electricity from a natural gas CT plant is the use of a combined-cycle design. For fossil fuel technologies, efficiencies typically range between approximately 30 and 50 percent. A typical coal-fired Rankine cycle power plant has a typical base load efficiency of approximately 30 percent, while a natural gas-fired combined-cycle unit operating under optimal conditions has a base load efficiency of approximately 50 percent or greater.

Combined-cycle units operate based on a combination of two thermodynamic cycles: the Brayton and the Rankine cycles. A CT operates on the Brayton cycle, and the HRSG and steam turbine operate on the Rankine cycle. The combination of the two thermodynamic cycles allows for the high efficiency associated with combined-cycle plants.

The combined-cycle natural gas turbine technology proposed for the Project is the high efficiency Siemens SGT6-8000H CT. In addition to the high-efficiency primary components of the turbine, there are a number of other design features employed within the CT that can improve overall efficiency of the machine, including those summarized in the following paragraphs.

Evaporative Inlet Air Cooling or Inlet Fogging

Evaporative inlet air cooling or inlet fogging is used during middle and high ambient air temperature operating cases to lower the temperature of the inlet combustion air and thus increase the density of the combustion air. Increasing the density increases the mass flow rate of the inlet combustion air, which allows more fuel to be combusted in the CT process. This provides greater electrical power output from the CT during certain operating cases and in cases of high electrical power demand. Increasing the electrical power output provides increased overall energy efficiency of the CT.

Periodic Burner Tuning

CTs have regularly scheduled maintenance programs. These maintenance programs are important for the reliable operation of the unit, as well as to maintain optimal efficiency. As the CT is operated, the unit experiences degradation and loss in performance. The CT maintenance program helps restore the recoverable lost performance. The maintenance program schedule is determined by the number of hours of operation and/or turbine starts. There are three basic maintenance levels: combustion inspections, hot gas path inspections, and major overhauls. Combustion inspections are the most frequent of the maintenance cycles. As part of this maintenance activity, the combustors are tuned to restore highly efficient low-emissions operation.

Reduction in Heat Loss

CTs have high operating temperatures. The high operating temperatures are a result of the heat of compression in the compressor along with the fuel combustion in the burners. To minimize heat loss from the CT and protect personnel and equipment around the machine, insulation blankets are applied to the CT casing. These blankets minimize heat loss through the CT shell and help improve overall efficiency of the machine.

Instrumentation and Controls

CTs have sophisticated instrumentation and controls to automatically control operation of the CT. The control system is a digital-type and is supplied with the CT. The distributed control system controls all aspects of the turbine's operation, including the fuel flow rate and burner operations to achieve high efficiency and low-NO_x combustion. The control system monitors operation of the unit and modulates fuel flow and turbine operation to achieve optimal high-efficiency, low-emissions performance under all operating cases.

HRSG Energy Efficiency Designs, Practices, and Procedures

The HRSG takes waste heat from the CT exhaust and uses the waste heat to convert boiler feed water to steam. Duct burning involves burning additional natural gas in the ducts to the HRSG, which increases the temperature of the exhaust gas and creates additional steam for the steam turbine.

The combined-cycle HRSG is generally a horizontal natural circulation drum-type heat exchanger designed with three pressure levels of steam generation, reheat, split superheater sections with interstage attemperation, postcombustion emissions control equipment, and condensate recirculation. The HRSG is designed to maximize conversion of the CT exhaust gas waste heat to steam for all plant ambient and load conditions. Maximizing steam generation will increase the steam turbine's power generation, which maximizes overall plant efficiency.

HRSG Design

HRSGs are heat exchangers designed to capture as much thermal energy as possible from CT exhaust gases. This is performed at multiple pressure levels. For a drum-type configuration, each pressure level incorporates an economizer section(s), evaporator section, and superheater section(s). These heat transfer sections are made up of many thin-walled tubes to provide surface area to maximize the transfer of heat to the working fluid. Most of the tubes also include extended surfaces (e.g., fins). The extended surface optimizes the heat transfer, while minimizing the overall size of the HRSG. Additionally, flow guides are used to distribute the exhaust gas flow evenly through the HRSG to allow for efficient use of the heat transfer surfaces and postcombustion emissions control components. Low-temperature economizer sections employ recirculation systems to minimize cold-end corrosion, and stack dampers are sometimes used for cycling operation to conserve thermal energy within the HRSG when the unit is off line.

Insulation

The temperatures inside the HRSG are nearly equivalent to the exhaust gas temperatures of the turbine. For CTs, these temperatures can approach 1,200°F. HRSGs are designed to maximize the conversion of the waste heat to steam. One aspect of the HRSG design in maximizing this waste heat conversion is the use of insulation on all gas path surfaces exposed to ambient air. Insulation minimizes heat loss to the ambient air, thereby improving the overall efficiency of the

HRSG. Insulation is applied to the HRSG panels that make up the shell of the unit, to the high-temperature steam and water lines, and typically to the bottom portion of the stack.

Minimizing Fouling of Heat Exchange Surfaces

HRSGs are made up of a number of tubes within the shell of the unit that are used to generate steam from the CT exhaust gas waste heat. To maximize this heat transfer, the tubes and their extended surfaces need to be as clean as possible. Fouling of the tube surfaces impedes the transfer of heat. Fouling occurs from the constituents within the exhaust gas stream. To minimize fouling, filtration of the inlet air to the CT is performed. Additionally, cleaning of the tubes is performed during periodic outages. By reducing the fouling, the heat transfer efficiency of the HRSG tubes is maximized.

Minimizing Vented Steam and Repair of Steam Leaks

Minimizing the number and quantity of steam vents and the timely repair of steam leaks is important in maintaining the plant's efficiency. A combined-cycle facility has several locations where steam is vented from the process, including the deaerator vents, blowdown tank vents, and vacuum pumps/steam jet air ejectors. These steam vents are necessary to improve the overall heat transfer within the HRSG and condenser by removing solids and air that potentially reduce the efficiency of the heat transfer surfaces. Minimizing the number and quantity of steam vents and repairing steam leaks in a timely manner is in the best interest of C4GT and will be performed for this project.

Plantwide Energy Efficiency Designs, Practices, and Procedures

There are a number of other designs, practices, and procedures within the combined-cycle plant that help improve overall plant efficiency. These include fuel gas preheating and drain operation.

Fuel Gas Preheating

The overall efficiency of the CT process is increased as the temperature of fuel is increased. For combined-cycle pants, fuel gas is generally heated with high temperature water from the HRSG. This improves the efficiency of the CT. C4GT will employ fuel gas heating of the primary fuel, pipeline-quality natural gas.

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Drain Operation

Drains are required to allow for draining the equipment for maintenance (i.e., maintenance drains) and also allow condensate to be removed from the steam piping and drains for operation (i.e., operation drains). Operation drains are generally controlled to minimize the loss of energy from the cycle. This is accomplished by closing the drains as soon as the appropriate steam conditions are achieved.

The other available control technology for GHG emissions for the CTs/HRSGs is carbon capture and sequestration (CCS).

Carbon Capture and Sequestration

CCS consists of the separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 as a fluid via pipeline, and injection and long-term geologic storage.

The capture technologies applicable for fossil fuel combustion include the following:

- Precombustion systems designed to separate CO_2 and hydrogen in the high-pressure syngas typically produced at integrated gasification combined-cycle power plants.
- Postcombustion systems designed to separate CO_2 from the flue gas produced by the combustion process.
- Oxy-combustion systems that use high-purity oxygen rather than air in the combustion process to produce a highly concentrated CO_2 stream.

Precombustion systems are not technically feasible for this project, as they would fundamentally redefine the nature of the proposed source. Both post- and oxy-combustion systems would be considered an available control option, and both are currently in development as demonstration projects at coal-fired power plants using amine and ammonia capture systems to remove CO_2 from the flue gas. These capture systems are associated with high energy penalties.

There are several technologies at various stages of development with the potential to separate and capture CO_2. Some have been demonstrated at the pilot scale, while others are at the bench-top or laboratory stage of development. Most of the existing applications, and those in the planning stage, are designed to control CO_2 from combustion of fossil fuels, primarily coal and natural gas. Several demonstration projects are being supported through the U.S. Department of Energy's Clean Coal Power Initiative, but these facilities will exclusively burn coal (Interagency Task Force, 2010).

Carbon sequestration usually involves the injection of CO_2 into deep geological formations of porous rock that are capped by one or more nonporous layers of rock. Injected at high pressure, the CO_2 exists as a liquid that flows through the porous rock to fill the voids. Saline formations, exhausted oil and gas fields, and unmineable coal seams are candidates for CO_2 storage. Also, CO_2 injected for enhanced oil recovery projects can result in long-term sequestration depending on the geologic conditions. Other schemes include liquid storage in the ocean, solid storage by reactions leading to the creation of carbonates, and terrestrial sequestration.

Clean Fuels

The CAA includes clean fuels in the definition of BACT; therefore, clean fuels should be considered as a potential control technology for GHG emissions. Fuels that reduce GHG emissions of a new source should be considered in a BACT analysis provided they do not redefine the source. For example, a proposed new coal plant should not have to consider switching fuels from coal to natural gas as that would redefine the source. However, different types of coal may be considered to evaluate the benefits of combusting various types of coal in reducing GHG emissions.

5.3.6.2 GHG BACT Technical Feasibility (Step 2)

Step 2 of the top-down BACT analysis is the elimination of technically infeasible options. EPA considers a technology to be technically feasible if, one, it has been demonstrated and operated successfully on the same type of source under review, or two, it is available and applicable to the source type under review. A control technology should also be considered technically available or applicable if it has been demonstrated on an exhaust stream with similar physical and chemical characteristics.

CCS is not considered technically feasible for a natural gas-fired combined-cycle facility and therefore is not further considered in this BACT analysis. CCS technology has not been demonstrated on a full-scale power generation facility, and CCS technology is not currently commercially available. In addition, there has been no demonstration of CCS technology on a similar exhaust gas stream.

5.3.6.3 GHG BACT Ranking of Controls (Step 3)

Step 3 of the top-down BACT analysis is the ranking of technically feasible options.

Because it has been determined that CCS is not technically feasible, the remaining technically feasible options include high thermal or energy efficiency and the exclusive use of clean fuels. The energy efficiency must look at the high thermal efficiency design of the CT/HRSG system as well as various energy efficiency improvements throughout the facility, as described in the previous section.

5.3.6.4 Economic, Energy, and Environmental Impacts (Step 4)

Step 4 of the top-down BACT analysis is the consideration of economic, energy, and environmental impacts.

The Project is committed to the exclusive combustion of pipeline-quality natural gas as the primary fuel in the CTs/HRSGs. Therefore, no further analysis of economic, energy, or environmental impacts is necessary.

5.3.6.5 GHG BACT Selection (Step 5)

Selection of BACT

Step 5 of the top-down BACT analysis is the selection of BACT. C4GT proposes as BACT for GHG the following energy efficiency designs, practices, and procedures for the proposed facility:

- Use of combine-cycle technology.
- CT energy efficiency designs, practices, and procedures:
  - Efficient turbine design.
  - Turbine inlet air cooling.
  - Periodic turbine burner tuning.

  - o Reduction in heat loss, i.e., insulation of the CT.
  - o Instrumentation and controls.
- HRSG energy efficiency designs, practices, and procedures:
  - o Efficient heat exchanger design.
  - o Reduction in heat loss, i.e., insulation of HRSG.
  - o Minimizing fouling of heat exchanger surfaces.
  - o Minimizing steam venting and repair of steam leaks.
- Plantwide energy efficiency designs, practices, and procedures:
  - o Fuel gas preheating.
  - o Drain operation.

Proposed GHG BACT Emissions Limit for CTs/HRSGs

C4GT proposes 4,210,431 tpy CO_2e for CTs/HRSGs GHG BACT emissions limits for all operating cases, including during periods of startup and shutdown based on an annual basis for the Siemens turbine option.

This numerical GHG BACT emissions limit is based on the exclusive use of pipeline-quality natural gas as the primary fuel. Compliance with this numerical GHG BACT emissions limit will be demonstrated by measuring and recording the total heat input to the CTs/HRSGs expressed in million British thermal units per year. CO_2 emissions will be calculated using the methodology for calculating CO_2 emissions under the ARP in accordance with 40 CFR 75, Equation G-4, as described in the following:

$$W_{CO_2} = \frac{F_c \times H \times U_f \times MW_{CO_2}}{2{,}000}$$

where: W_{CO_2} = CO_2 emissions in tpy.

F_c = carbon based F-factor (1,040 standard cubic feet per million British thermal units [scf/MMBtu] for natural gas and 1,420 scf/MMBtu for ULSD fuel).

H = heat input in million British thermal units per year.

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$U_f = \frac{1}{385}$ standard cubic foot per pound-mole (scf/lb-mol) of CO_2 at 14.7 psia and 68°F.

MW_{CO_2} = molecular weight of CO_2, 44 pounds per pound-mole (lb/lb-mol).

Methane and nitrous oxide emissions will be calculated using emissions factors as defined in the Mandatory Greenhouse Gas Reporting Rule, Table C-2. CO_2e emissions will then be calculated using each GHG pollutant's respective global warming potential as defined in the Mandatory Greenhouse Gas Reporting Rule, Table A-1.

To ensure the inherent efficiency of the plant remains high throughout all operating modes, C4GT also proposes a numerical limit on the total facility net heat rate, expressed in units of Btu/kWh on an annual basis. The proposed facility net heat rate is derived using the weighted average CT/HRSG net heat rate at the base load combusting natural gas operating case, which constitutes the majority of total operation.

The weighted average base load net heat rate is calculated by multiplying the heat rate associated with each operating case listed previously by the corresponding percentage of total operating hours anticipated by that case on an annual basis. Note that this net heat rate reflects the net electrical power production, meaning the denominator is the amount of electrical power provided to the grid. It does not reflect the total amount of electrical power produced by the plant, or gross electrical power, which also includes the parasitic load consumed by operation of the plant.

The following margins were used to adjust base load heat rates for these operating cases:

- 3.3 percent to account for the potential difference between the calculated plant heat rate and the actual tested plant heat rate.
- 6 percent for CT/HRSG efficiency losses due to degradation prior to CT/HRSG overhaul.
- 3 percent for auxiliary plant equipment losses due to degradation over time.

This results in the following proposed rates:

Turbine Model	Heat Rate (Btu/Kwh gross)	CO_2 Emissions Rate (lb/MWh gross)
Siemens	7,098	875

These heat and emissions rates were based on natural gas firing with duct burners. The proposed CO_2 emissions rates compare well with the range of recent BACT determinations listed in the RBLC database (see Appendix C, Table C-6).

C4GT will demonstrate compliance with this proposed weighted average GHG BACT limit on an annual basis by measuring/monitoring total natural gas consumption and net electrical output during base load operations when combusting natural gas without supplemental duct firing and during base load operations combusting natural gas with supplemental duct firing. Measuring and monitoring is a viable surrogate to ensure efficient operation during all operating periods. CO_2 emissions will be calculated using Equation G-4 under the provisions of the ARP, 40 CFR 75 using the heat input of the natural gas combusted during these two operating cases only. Methane and nitrous oxide emissions will be calculated using emissions factors as defined in the Mandatory Greenhouse Gas Reporting Rule, Table C-2. CO_2e emissions will then be calculated using each GHG pollutant's respective global warming potential as defined in the Mandatory Greenhouse Gas Reporting Rule, Table A-1. The total calculated CO_2e emissions for these two operating cases will be divided by the total net power output in megawatt-hours generated during these two operating cases only for the same 12-month period to obtain a weighted average CO_2e emissions rate expressed in tons per megawatt-hour.

In addition, C4GT will demonstrate compliance with GHG BACT during operating cases other than base load operations when combusting natural gas without supplemental duct firing and during base load operations combusting natural gas with supplemental duct firing by demonstrating compliance with the total annual sitewide GHG emissions limit of 4,274,083 tpy on an annual basis, measured as CO_2e.

5.4 Startup/Shutdown BACT Analysis

BACT must be met at all times, including during periods of startup and shutdown. Pollutants subject to BACT analysis and review must address BACT emissions limits not only during normal operation but also during startup and shutdown.

NO_X, CO, and VOC emissions are expected to have higher hourly emissions rates during periods of startup and shutdown. This is due, in general, to two factors: one, these pollutants are the products of incomplete combustion – complete combustion does not occur during periods of startup and shutdown; and two, NO_X, CO, and VOC emissions are controlled by SCR and oxidation catalyst, respectively. When the CT exhaust gas is below the minimum catalyst activation temperature, the control system does not permit the flow of ammonia, and therefore the SCR system is not functioning. Additionally, the oxidation catalyst does not function at its peak efficiency due to lower exhaust temperatures that are evident during startup and shutdown.

Other pollutants, such as $PM/PM_{10}/PM_{2.5}$, SO_2, and H_2SO_4 have lower emissions during startup and shutdown as these emissions are directly proportional to the amount of fuel flow. Because fuel flow is lower during startup and shutdown as compared to normal operation, emissions from these pollutants during startup and shutdown will be lower as compared to normal operation. Therefore, the BACT emissions limits proposed for these pollutants will be valid during periods of normal operation as well as during periods of startup and shutdown.

C4GT proposes the BACT emissions limits provided in Table 5-4 for NO_X, CO, and VOC during startup and shutdown.

5.5 Auxiliary Boiler BACT Analysis

C4GT proposes to install a 105-MMBtu/hr auxiliary boiler, operated using pipeline-quality, natural gas, only.

Table 5-4. Proposed BACT Emissions Limits per CT Unit during Startup and Shutdown, Natural Gas

	Cold Start		Warm Start		Hot Start		Shutdown	
	Emissions (lb/event)	Duration (minutes)	Emissions (lb/event)	Duration (minutes)	Emissions (lb/event)	Duration (minutes)	Emissions (lb/event)	Duration (minutes)
NO_x	94.5	55	116.2	55	97.9	50	50.8	38
CO	433.6	55	396.8	55	335.8	50	184.0	38
VOC	36.1	55	34.0	55	33.6	50	55.3	38

Source: ECT, 2016.

5.5.1 BACT for NO_x

5.5.1.1 Available NO_x Control Technologies (Step 1)

The available control technologies for industrial boilers include low- and ultra-low-NO_x burners and SCR.

5.5.1.2 NO_x BACT Technical Feasibility (Steps 2 and 3)

Both low- and ultra-low-NO_x burners are feasible technologies for the auxiliary boiler. Because of the outlet temperature of the flue gas, the efficiency of SCR is not maximized. The typical range for the SCR process is 480 to 800°F, with the optimal temperature range of 700 to 750°F (EPA, 2002). The NO_x removal efficiency decreases below 50 percent at temperatures below 500°F (EPA, 2002). Based on vendor data, the economizer exit gas temperature is estimated at 300°F or less. The addition of an economizer bypass to increase the exit flue gas temperature may reduce boiler efficiency. A decrease in boiler efficiency would require additional fuel to be burned, resulting in an increase in boiler emissions.

5.5.1.3 Proposed NO_x BACT Emissions Limit (Steps 4 and 5)

To determine recent BACT determinations for the auxiliary boiler, the RBLC database was queried for commercial/institutional boilers and furnaces of greater than 100 MMBtu/hr but less than 250 MMBtu/hr heat input firing natural gas only. Determinations were obtained from the RBLC database for the last ten years and are summarized in Appendix C, Table C-7. The lowest NO_x limit listed is 0.006 lb/MMBtu for the Corpus Christi Terminal. However, this is a draft determination; therefore, this limit has not yet been demonstrated. Other BACT determinations range from 0.01 to 0.04 lb/MMBtu. The proposed emissions rate of 0.011 lb/MMBtu using a low-NO_x burner is within the typical range considered as BACT for an auxiliary boiler.

5.5.2 BACT for CO

5.5.2.1 Available CO Control Technologies (Step 1)

The available control technologies for CO include GCP and oxidation catalyst.

5.5.2.2 CO BACT Technical Feasibility (Steps 2 and 3)

Good combustion practices are feasible for the auxiliary boiler. Heat limitations do exist for application of oxidation catalyst for the auxiliary boiler. Using oxidation catalyst control technology, lower temperatures (on the order of 500°F) are needed to oxidize CO at exhaust gas temperatures. However, based on vendor data, the exhaust gas will be in the range of 300°F, which can significantly reduce the percent conversion of CO. The inclusion of an economizer bypass can reduce the efficiency of the boiler and result in higher emissions due to an increased amount of fuel consumption.

5.5.2.3 Proposed CO BACT Emissions Limit (Steps 4 and 5)

To determine recent BACT determinations for the auxiliary boiler, the RBLC database was queried for commercial/institutional boilers and furnaces of less than 100 MMBtu/hr heat input firing natural gas, only. The Emberclear GTL facility located in Mississippi is the only facility within the prior ten years with a BACT determination using oxidation catalyst as a control. However, this is a draft determination, and the boiler is a larger 261-MMBtu/hr unit. Determinations were obtained from the RBLC database for the last ten years and are summarized in Appendix C, Table C-8. The lowest nondraft CO limit for similar-sized boilers (greater than 100 MMBtu/hr and less than 250 MMBtu/hr) listed in the RBLC database was a determination at 0.0148 lb/MMBtu for the MGM Mirage in Utah. However, this limit represents LAER. Other BACT determinations range from 0.035 to 0.0.084 lb/MMBtu. C4GT is proposing a CO rate of 0.037 lb/MMBtu using GCP as BACT for the auxiliary boiler.

5.5.3 BACT for VOC

5.5.3.1 Available VOC Control Technologies (Step 1)

Available control technologies for VOC emissions from the auxiliary boiler include GCP and pipeline-quality natural gas combustion.

5.5.3.2 VOC BACT Technical Feasibility (Steps 2 and 3)

Both the application of GCP and use of pipeline-quality natural gas are feasible technical options.

5.5.3.3 Proposed VOC BACT Emissions Limit (Steps 4 and 5)

Determinations were obtained from the RBLC database for the last ten years and are summarized in Appendix C, Table C-9. The lowest VOC limit listed in the RBLC database was 0.0013 lb/MMBtu for the Karn Wedock Generating Complex in Michigan. However, several

BACT determinations range from 0.0052 to 0.0055 lb/MMBtu. C4GT is proposing a VOC limit of 0.005 lb/MMBtu, which is in range of typical BACT determinations.

5.5.4 BACT for PM/PM_{10}/$PM_{2.5}$

5.5.4.1 Available PM/PM_{10}/$PM_{2.5}$ Control Technologies

There are no postcombustion control systems for PM/PM_{10}/$PM_{2.5}$ emissions that have been applied to boilers, since exhaust gas PM concentrations are inherently low. Use of clean, i.e., low-sulfur fuel, is the most common method used to limit PM/PM_{10}/$PM_{2.5}$ emissions.

5.5.4.2 PM/PM_{10}/$PM_{2.5}$ Technical Feasibility (Steps 2 and 3)

Use of clean fuel is a feasible control measure for PM/PM_{10}/$PM_{2.5}$ emissions.

5.5.4.3 Proposed PM/PM_{10}/$PM_{2.5}$ Emissions Limits (Steps 4 and 5)

Determinations were obtained from the RBLC database for the last ten years and are summarized in Appendix C, Table C-10. The lowest PM limits listed in the RBLC database are three draft BACT determinations at 0.0018 lb/MMBtu (filterable PM). The lowest nondraft BACT determination is 0.005 lb/MMBtu for the Shintech Plaquemine Plant in Louisiana. Other BACT determinations range from 0.0052 to 0.02 lb/MMBtu. C4GT is proposing a total filterable PM (PM/PM_{10}/$PM_{2.5}$) emissions rate of 0.007 lb/MMBtu for the auxiliary boiler.

5.5.5 BACT for H_2SO_4

5.5.5.1 Available H_2SO_4 Control Technologies (Step 1)

There are no postcombustion control systems, such as scrubbers or duct sorbent injection, for H_2SO_4 emissions that have been applied to small natural gas-fired boilers. The only control measure is the use of low-sulfur fuel.

5.5.5.2 H_2SO_4 Technical Feasibility (Steps 2 and 3)

The use of low-sulfur fuel is technically feasible to control H_2SO_4 emissions from a natural gas-fired boiler. Use of low-sulfur fuel is the only control measure being considered.

5.5.5.3 Proposed H_2SO_4 Emissions Limits (Steps 4 and 5)

Determinations were obtained from the RBLC database for the last ten years and are summarized in Appendix C, Table C-11. No numerical BACT determinations for H_2SO_4 for similar sized units were listed for auxiliary boilers, and use of natural gas was listed as the control technique. C4GT is proposing GCP and use of low-sulfur natural gas as BACT for the auxiliary boiler.

5.5.6 BACT for GHGs

5.5.6.1 Available GHG Control Technologies

There is currently no technically feasible add-on control technology to reduce GHG emissions from the auxiliary boiler. Other methods to reduce GHG from the auxiliary boiler include efficient boiler design, cleaner fuels, and GCP. These measures are being incorporated by C4GT and proposed as BACT for the auxiliary boiler.

5.5.6.2 GHG Technical Feasibility (Steps 2 and 3)

Efficient boiler design, cleaner fuels, and GCP are all technically feasible to control GHG emissions from natural gas-fired boiler. For the purposes of this BACT analysis, efficient boiler design, cleaner fuels, and GCP are being considered together.

5.5.6.3 Proposed GHG Emissions Limits (Steps 4 and 5)

Since efficient boiler design, cleaner fuels, and GCP are being considered in concert, ranking the effectiveness of each is not necessary. C4GT is proposing the use of efficient boiler design, cleaner fuels, and GCP as BACT for the auxiliary boiler.

5.6 Cooling Tower BACT Analysis

The only feasible technology for controlling $PM/PM_{10}/PM_{2.5}$ emissions from wet mechanical draft cooling towers is the use of drift eliminators. Drift eliminators control $PM/PM_{10}/PM_{2.5}$ emissions by capturing water droplets from cooling tower exhaust using inertial separation principles. High efficiency drift eliminators provide a drift rate of 0.0005 percent of the total recirculating cooling water rate. C4GT proposes to use high efficiency drift eliminators with a drift rate of 0.0005 percent as $PM/PM_{10}/PM_{2.5}$ BACT for the cooling tower.

5.7 Emergency Diesel Generator and Firewater Pump BACT Analysis

5.7.1 BACT for NO_X

The 315-bhp firewater pump engine will meet the limits of 40 CFR 60, Subpart IIII, NSPS for Stationary CI Internal Combustion Engines, effective September 11, 2006. Table 4 in 40 CFR 60.4219 lists emissions limits for stationary firewater pump engines. The combined standard for model year 2009 and later 350-bhp engine for nonmethane hydrocarbon (NMHC) + NO_X of 3.0 grams per brake-horsepower-hour (g/bhp-hr) is proposed as BACT. Although add-on NO_X and VOC controls are feasible for this size engine, the fact this is an emergency engine limited to 100 hr/yr for maintenance and testing make add-on controls impractical.

The planned new 3,633-bhp emergency generator engine will meet Tier II emissions limits of NSPS Subpart IIII shown in Table 1 of 40 CFR 89.112. The NMHC and NO_X Tier II emissions limit of 4.8 g/bhp-hr is proposed as BACT.

5.7.2 BACT for CO

The firewater pump engine will meet the limits of 40 CFR 60, Subpart IIII, NSPS for Stationary CI Internal Combustion Engines, effective September 11, 2006. Table 4 in 40 CFR 60.4219 lists the emissions limits for the 315-bhp stationary firewater pump engine. The NSPS limit of 2.6 g/bhp-hr is proposed as BACT. The fact this is an emergency engine limited to 100 hr/yr for maintenance and testing make add-on controls impractical.

The planned new 3,633-bhp emergency generator engine will meet Tier II emissions limits of NSPS Subpart IIII shown in Table 1 of 40 CFR 89.112. The CO Tier II emissions limit of 2.6 g/bhp-hr is proposed as BACT.

5.7.3 BACT for VOC

The firewater pump engine will meet the limits of 40 CFR 60, Subpart IIII, NSPS for Stationary CI Internal Combustion Engines, effective September 11, 2006. Table 4 in 40 CFR 60.4219 lists the emissions limits for the 315-bhp stationary firewater pump engine. The combined standard for NMHC + NO_x of 3.0 g/bhp-hr is proposed as BACT. The fact this is an emergency engine limited to 100 hr/yr for maintenance and testing make add-on controls impractical.

The planned new 3,633-bhp emergency generator engine will meet Tier II emissions limits of NSPS Subpart IIII shown in Table 1 of 40 CFR 89.112. The NMHC and NO_x Tier II emissions limit of 4.8 g/bhp-hr is proposed as BACT.

5.7.4 BACT for PM/PM_{10}/$PM_{2.5}$

The firewater pump engine will meet the limits of 40 CFR 60, Subpart IIII, NSPS for Stationary CI Internal Combustion Engines, effective September 11, 2006. Table 4 in 40 CFR 60.4219 lists the emissions limits for the 315-bhp stationary firewater pump engine. The standard for PM of 0.15 g/bhp-hr is proposed as BACT. The fact this is an emergency engine limited to 100 hr/yr for maintenance and testing make add-on controls impractical.

The planned new 3,633-bhp emergency generator engine will meet Tier II emissions limits of NSPS Subpart IIII shown in Table 1 of 40 CFR 89.112. The PM Tier II emissions limit of 0.15 g/bhp-hr is proposed as BACT.

5.7.5 BACT for H_2SO_4

The firewater pump and emergency generator engines will meet the limits of 40 CFR 60, Subpart IIII, NSPS for Stationary CI Internal Combustion Engines, effective September 11, 2006. The fact they are emergency engine limited to 100 hr/yr for maintenance and testing make add-on controls impractical. The exclusive use of ULSD fuel and limited hours of operation will limit H_2SO_4 emissions and is proposed as BACT for the emergency engines.

5.7.6 BACT for GHG

There is currently no technically feasible add-on control technology to reduce GHG emissions from the firewater pump and emergency generator engines. C4GT is proposing to limit GHG emissions from these sources by incorporating GCP and limiting the hours of operation. Both engines will be maintained in accordance with the manufacturer's specifications.

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5.8 Dew Point Heater BACT Analysis

5.8.1 BACT for NO_x

The dew point heater is a relatively small combustion source, rated at 16 MMBtu/hr and will fire natural gas. The RBLC database was queried for industrial-sized boilers and furnaces less than 100 MMBtu/hr heat input firing natural gas, only. Two 90-MMBtu/hr furnaces are shown with NO_x BACT limits of 0.009 lb/MMBtu, but these units are much larger than the proposed dew point heater and equipped with low-NO_x burners and SCR. The unit being proposed for C4GT will emit NO_x at 0.011 lb/MMBtu. There are no combustion modifications or add-on postcombustion processes typically applied to dew point heaters of this capacity. Therefore, proposed BACT for the dew point heater is the exclusive use of natural gas and GCP.

5.8.2 BACT for CO

The lowest CO BACT determination for a heater listed in the RBLC database is a draft determination 0.0194 lb/MMBtu for a 58.8-MMBtu/hr startup heater. C4GT is proposing a BACT limit of 0.037 lb/MMBtu for the much smaller 16-MMBtu/hr dew point heater using GCP and clean fuel.

5.8.3 BACT for VOC

The RBLC database was queried for industrial-sized boilers and furnaces less than 100 MMBtu/hr heat input firing natural gas, only. The lowest VOC BACT limit for heaters and furnaces listed in the RBLC database is a draft determination of 0.0014 lb/MMBtu for a 58.87-MMBtu/hr fuel heater. The proposed C4GT 16-MMBtu/hr heater is nearer in size to other RBLC listings with limits of 0.005 and 0.0054 lb/MMBtu. C4GT is proposing a VOC BACT limit of 0.005 lb/MMBtu.

5.8.4 BACT for $PM/PM_{10}/PM_{2.5}$

The lowest PM BACT limit for a 12-MMBtu/hr fuel heater is 0.0018 lb/MMBtu. However, this is a draft determination. The lowest PM BACT nondraft determination for a heater listed in the RBLC database is 0.0044 lb/MMBtu. This rate is for a 169-MMBtu/hr reheat furnace, which is much larger than the dew point heater being proposed for C4GT. C4GT is proposing a BACT limit of 0.007 lb/MMBtu to be achieved using clean fuel and good combustion practice.

5.8.5 BACT for H_2SO_4

Emissions of H_2SO_4 from the small 16-MMBtu/hr dew point heater will be negligible, i.e. maximum emissions rate of much less than 1.0 lb/hr. C4GT proposes GCP and the use of natural gas as BACT for the dew point heater.

5.8.6 BACT for GHG

There is currently no technically feasible add-on control technology to reduce GHG emissions from the dew point heater. Other methods to reduce GHG from the dew point heater include efficient boiler design, cleaner fuels, and GCP. These measures are being incorporated for C4GT and proposed as BACT for the dew point heater.

5.9 Circuit Breaker GHG BACT Analysis

SF_6 is one of the six pollutants that comprise GHGs. SF_6 emissions are not required to be reported under the Mandatory GHG Reporting Rule for fuel combustion sources, because SF_6 is not a naturally occurring pollutant that results from the combustion process. SF_6 is a synthetic gas that possesses excellent electrical insulating properties. Because of this, SF_6 is used as an insulating gas in many electrical circuit breakers. The main circuit breaker for the C4GT facility will contain a quantity of SF_6 for the purpose of acting as an electrical insulator.

There may potentially be some small, nonroutine emissions of SF_6 during the operation resulting from opening and closing the circuit breaker. To minimize the emissions of SF_6, C4GT proposes to use state-of-the-art enclosed-pressure SF_6 circuit breakers with leak detection as BACT for SF_6. In comparison to older circuit breakers containing SF_6, modern circuit breakers are designed as totally enclosed-pressure systems with a far lower potential for SF_6 emissions. In addition, the effectiveness of the leak-tight closed systems can be enhanced by equipping them with a density alarm that provides a warning if small amounts of gas have escaped. This will prevent any excess SF_6 emissions from being emitted into the atmosphere.

5.10 Summary of Proposed BACT Levels

Tables 5-5 and 5-6 provide summaries of the BACT control technologies proposed for the CT/HRSG and ancillary sources, respectively.

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Table 5-5. Summary of Proposed BACT Emissions Limits for the Siemens CTs/HRSG

Pollutant	Fuel/Condition	Emissions Rate		Control Technology	Basis
NO_x	Natural gas	2.0	ppmvd @ 15% O_2	DLN SCR	BACT
	Startup natural gas	116.2	lb/event		BACT
	Shutdown	50.8	lb/event		BACT
CO	Natural gas	2.0	ppmvd @ 15% O_2	Oxidation catalyst	BACT
	Startup natural gas	433.6	lb/event		BACT
	Shutdown	184	lb/event		BACT
VOC	Natural gas	2.0	ppmvd @ 15% O_2	Oxidation catalyst	BACT
	Startup natural gas	36.1	lb/event		BACT
	Shutdown	55.3	lb/event		BACT
PM	Natural gas	Exclusive use of pipeline-quality natural gas			BACT
H_2SO_4	Natural gas	Exclusive use of pipeline-quality natural gas			BACT
GHG	Natural gas	7,098	Btu/kWh	Efficient combustion	BACT
	Natural gas	875	lb CO_2/MWh	Efficient combustion	BACT

Notes: Startup values based on cold-start, which represents worst-case emissions.

Sources: C4GT, 2016.
ECT, 2016.

Table 5-6. Summary of Proposed BACT Emissions Limits for Ancillary Sources

Emissions Unit	Pollutant	Fuel	Emissions Rate		Control Technology	Basis
Auxiliary boiler	NO_x	Natural gas	0.011	lb/MMBtu	GCP	BACT
	VOC	Natural gas	0.005	lb/MMBtu	GCP	BACT
	CO	Natural gas	0.037	lb/MMBtu	GCP	BACT
	PM	Natural gas	0.007	lb/MMBtu	Natural gas, GCP	BACT
	H_2SO_4	Natural gas	Negligible		Low sulfur fuel	BACT
	GHG	Natural gas	53,822	ton CO_2e/yr	GCP	BACT
Firewater pump engine	NMHC + NO_x	ULSD	3.0	g/bhp-hr	GCP, compliance with NSPS	BACT
	CO	ULSD	2.6	g/bhp-hr	GCP, compliance with NSPS	BACT
	PM	ULSD	0.15	g/bhp-hr	ULSD fuel, compliance with NSPS	BACT
	GHG	ULSD	90	ton CO_2e/yr	Limited hours of operation	BACT
Emergency generator engine	NMHC + NO_x	ULSD	4.8	g/bhp-hr	GCP, compliance with NSPS	BACT
	CO	ULSD	2.6	g/bhp-hr	GCP, compliance with NSPS	BACT
	PM	ULSD	0.15	g/bhp-hr	ULSD fuel, compliance with NSPS	BACT
	GHG	ULSD	1,040	ton CO_2e/yr	Limited hours of operation	BACT
Dew point heater	NO_x	Natural gas	0.011	lb/MMBtu	Natural gas, GCP	BACT
	CO	Natural gas	0.037	lb/MMBtu	Natural gas, GCP	BACT
	VOC	Natural gas	0.005	lb/MMBtu	Natural gas, GCP	BACT
	$PM/PM_{10}/PM_{2.5}$	Natural gas	0.007	lb/MMBtu	Natural gas, GCP	BACT
	H_2SO_4	Natural gas	Negligible		Natural gas, GCP	BACT
	GHG	Natural gas	8,201	ton CO_2e/yr	Natural gas, GCP	BACT
Cooling tower	$PM/PM_{10}/PM_{2.5}$	N/A	0.0005%	drift rate	Drift eliminators	BACT

Sources: C4GT, 2016.
ECT, 2016.

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6.0 PSD Class II Modeling Procedures

Pending VDEQ's approval of the emissions sources' emissions rates and stack parameters, the air dispersion modeling for the project will be finalized, and Sections 6.0 through 10.0 and Appendices E through G will be provided as an addendum to Revision 2 of this application.

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7.0 Class II Area SIL Analysis Results

Pending VDEQ's approval of the emissions sources' emissions rates and stack parameters, the air dispersion modeling for the project will be finalized, and Sections 6.0 through 10.0 and Appendices E through G will be provided as an addendum to Revision 2 of this application.

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8.0 Class II Area Cumulative Impact Assessment Results

Pending VDEQ's approval of the emissions sources' emissions rates and stack parameters, the air dispersion modeling for the project will be finalized, and Sections 6.0 through 10.0 and Appendices E through G will be provided as an addendum to Revision 2 of this application.

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9.0 Additional Impact Analysis

Pending VDEQ's approval of the emissions sources' emissions rates and stack parameters, the air dispersion modeling for the project will be finalized, and Sections 6.0 through 10.0 and Appendices E through G will be provided as an addendum to Revision 2 of this application.

10.0 References/Bibliography

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APPENDIX A

APPLICATION FORMS

PERMIT FORMS
PURSUANT TO
<u>REGULATIONS FOR THE CONTROL AND ABATEMENT OF AIR POLLUTION</u>

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

AIR PERMITS
FORM 7 APPLICATION

NEW SOURCE REVIEW PERMITS
and STATE OPERATING PERMITS

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

What pages do I fill out for my facility?

- **All new sources and major modifications: 3**
- **All new and modified sources (except for true minors): 4**
- All new and modified sources and State Operating Permits: 7, 8, 9
- All new and modified major sources: 25, 26, 27, 28, 29

In addition, complete the following pages:

- For boilers, external combustion units, turbines: 10, (19, 20 if applicable), 21, 22, 23, 24, 30
- For stationary combustion engines: 11, (19, 20 if applicable), 21, 22, 30
- For incinerators: 12, 19, 20, 21, 22, 23, 24, 30
- For surface coating operations: 13, 14, (19, 20 if applicable), 21, 22, 23, 24, 30
- For quarry operations: 13, 19, 20, 21, 22
- For VOC/Petroleum storage tanks: 15, 16, 21, 22, 23, 24, 30
- For loading racks and oil water separators: 17, 21, 22, 23, 24, 30
- For fumigation operations: 18
- For all other sources: 13, (19, 20, 23, 24 if applicable), 21, 22, 30

****NOTE:** ***The facility only has to fill out the applicable pages that apply.*** If any pages are unused, the facility does not need to submit the unused pages with the application.

Source-Specific Form 7 Applications

There are some source-specific Form 7 Applications available for these sources:
(check out the DEQ website at http://www.deq.virginia.gov/Programs/Air/Forms.aspx)

- Asphalt plants (Form 7A)
- Crematories (Form 7B)
- Concrete Batch Plant (Form 7C)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY - AIR PERMITS

LOCAL GOVERNING BODY CERTIFICATION FORM

Facility Name: C4GT	Registration Number: TBD
Applicant's Name: C4GT, LLC	Name of Contact Person at the site: Anand Gangadharan
Applicant's Mailing address: 23955 Novi Road, Novi, MI 48375	Contact Person Telephone Number: 248-735-6684

Facility location (also attach map): The project is located in Charles City County, Virginia, along State Route 106, approximately 2,000 feet north and west of the intersection of State Route 685.

Facility type, and list of activities to be conducted: C4GT is an electric generating facility.

The applicant is in the process of completing an application for an air pollution control permit from the Virginia Department of Environmental Quality. In accordance with § 10.1-1321.1. Title 10.1, Code of Virginia (1950), as amended, before such a permit application can be considered complete, the applicant must obtain a certification from the governing body of the county, city or town in which the facility is to be located that the location and operation of the facility are consistent with all applicable ordinances adopted pursuant to Chapter 22 (§§ 15.2-2200 et seq.) of Title 15.2. The undersigned requests that an authorized representative of the local governing body sign the certification below.

Applicant's signature: [signature]	Date: 6-17-2016

The undersigned local government representative certifies to the consistency of the proposed location and operation of the facility described above with all applicable local ordinances adopted pursuant to Chapter 22 (§§15.2-2200 et seq.) of Title 15.2. of the Code of Virginia (1950) as amended, as follows:

(Check one block)

☐ The proposed facility is **fully consistent** with all applicable local ordinances.

☐ The proposed facility is **inconsistent** with applicable local ordinances; see attached information.

Signature of authorized local government representative:	Date:
Type or print name:	Title:
County, city or town:	

[THE LOCAL GOVERNMENT REPRESENTATIVE SHOULD FORWARD THE SIGNED CERTIFICATION TO THE APPROPRIATE DEQ REGIONAL OFFICE AND SEND A COPY TO THE APPLICANT.]

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As of July 1, 2012, air permit applications are subject to a fee. The fee does not apply to administrative amendments or true minor sources. Applications will be considered incomplete if the proper fee is not paid and will not be processed until full payment is received. Air permit application fees are not refundable.
Fees are adjusted every January 1st for CPI. THIS FORM IS VALID JANUARY 1, 2016 TO DECEMBER 31, 2016.
Send this form and a check (or money order) payable to "Treasurer of Virginia" to:
Department of Environmental Quality
Receipts Control
P.O. Box 1104
Richmond, VA 23218

Send a copy of this form with the permit application to:
The DEQ Regional Office

Please retain a copy for your records. Any questions should be directed to the DEQ regional office to which the application will be submitted. **Unsure of your fee? Contact the Regional Air Permit Manager.**

COMPANY NAME:	C4GT, LLC	FIN:	81-1468392
COMPANY REPRESENTATIVE:	Anand Gangadharan	REG. NO.	TBD
MAILING ADDRESS:	23955 Novi Road, Novi, MI 48375		
BUSINESS PHONE:	248-735-6684	FAX:	248-735-0088
FACILITY NAME:	C4GT		
PHYSICAL LOCATION:	3001 Roxbury Rd, Charles City, VA 23030		

PERMIT ACTIVITY	APPLICATION FEE AMOUNT	CHECK ONE
Sources subject to Title V permitting requirements:		
• Major NSR permit (Articles 7, 8, 9)	$31,558	X
• Major NSR permit amendment (Articles 7, 8, 9)*	$7,363	
• State major permit (Article 6)	$15,779	
• Title V permit (Articles 1, 3)	$21,039	
• Title V permit renewal (Articles 1, 3)	$10,519	
• Title V permit modification (Articles 1, 3)	$3,681	
• Minor NSR permit (Article 6)	$1,577	
• Minor NSR amendment (Article 6)*	$788	
• State operating permit (Article 5)	$7,363	
• State operating permit amendment (Article 5)*	$3,681	
Sources subject to Synthetic Minor permitting requirements:		
• Minor NSR permit (Article 6)	$525	
• Minor NSR amendment (Article 6)*	$262	
• State operating permit (Article 5)	$1,577	
• State operating permit amendment (Article 5)*	$841	
***FEES DO NOT APPLY TO ADMINISTRATIVE AMENDMENTS AIR PERMIT APPLICATION FEES ARE NOT REFUNDABLE**		

DEQ OFFICE TO WHICH PERMIT APPLICATION WILL BE SUBMITTED (check one)

☐ **SWRO/Abingdon**	☐ **NRO/Woodbridge**	☒ **PRO/Richmond**	**FOR DEQ USE ONLY** Date: ________ DC #: ________
☐ **VRO/Harrisonburg**	☐ **BRRO/Lynchburg or Roanoke**	☐ **TRO/Virginia Beach**	**Reg. No.:** ________

APPLICATION FEE FORM DEFINITIONS:

Administrative amendment – An administrative change to a permit issued pursuant to Article 1 (9 VAC 5-80-50 et seq.), Article 3 (9 VAC 5-80-360 et seq.), Article 5 (9 VAC 5-80-800 et seq.), Article 6 (9 VAC 5-80-1100 et seq.), Article 7 (9 VAC 5-80-1400 et seq.), Article 8 (9 VAC 5-80-1605 et seq.), or Article 9 (9 VAC 5-80-2000 et seq.) of 9 VAC 5 Chapter 80. Administrative amendments include, but are not limited to, the following:

- Corrections of typographical or any other error, defect or irregularity which does not substantially affect the permit,

- Identification of a change in the name, address, or phone number of any person identified in the permit, or of a similar minor administrative change at the source,

- Change in ownership or operational control of a source where the board determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittee has been submitted to the board.

Major new source review permit (Major NSR permit) – A permit issued pursuant to Article 7 (9 VAC 5-80-1400 et seq.), Article 8 (9 VAC 5-80-1605 et seq.), or Article 9 (9 VAC 5-80-2000 et seq.) of 9 VAC 5 Chapter 80. For purposes of fees, the Major NSR permit also includes applications for projects that are major modifications.

- An Article 7 permit is a preconstruction review permit (case-by-case Maximum Achievable Control Technology (MACT) determination) for the construction or reconstruction of any stationary source or emission unit that has the potential to emit, considering controls, 10 tons per year or more of any individual hazardous air pollutant (HAP) or 25 tons per year or more of any combination of HAPs and EPA has not promulgated a MACT standard or delisted the source category.

- An Article 8 permit is for a source (1) with the potential to emit over 250 tons per year of a single criteria pollutant OR (2) is in one of the listed source categories under 9 VAC 5-80-1615 and has the potential to emit over 100 tons per year of any criteria pollutant OR (3) with the potential to emit over 100,000 tons per year of CO_2 equivalent (CO_2e) (9 VAC 5-85 Part III). PSD permits are issued in areas that are in attainment of the National Ambient Air Quality Standards.

- An Article 9 permit is a preconstruction review permit for areas that are in nonattainment with a National Ambient Air Quality Standard (NAAQS). Nonattainment permits are required by any major new source that is being constructed in a nonattainment area and is major for the pollutant for which the area is in nonattainment. Nonattainment permitting requirements may also be triggered if an existing minor source makes a modification that results in the facility being major for the pollutant for which the area is in nonattainment. A major source is any source with potential to emit over 250 tons per year of a single criteria pollutant or is in one of the listed source categories under 9 VAC 5-80-2010 and the potential to emit over 100 tons per year of any criteria pollutant. However, if any area is in nonattainment for a specific pollutant, the major source threshold may be lower for that pollutant. For example, sources locating in the Northern Virginia Ozone Nonattainment Area which are part of the Ozone Transport Region would be a major source if they have the potential to emit more than 100 tons per year of NO_x and/or 50 tons per year of VOC regardless of source category. Nonattainment permits do not require an air quality analysis but require a source to control to the Lowest Achievable Emission Rate (LAER) and to obtain offsets.

Major NSR permit amendment – A change to a permit issued pursuant to Article 7 (9 VAC 5-80-1400 et seq.), Article 8 (9 VAC 5-80-1605 et seq.), or Article 9 (9 VAC 5-80-2000 et seq.) of 9 VAC 5 Chapter 80. Only minor amendments and significant amendments are included in this category.

Minor new source review permit (Minor NSR permit) – A permit to construct and operate issued under Article 6 (9 VAC 5-80-1100 et seq.) of 9 VAC 5 Chapter 80. Minor NSR permits are 1) categorically required; or 2) issued to sources whose uncontrolled emission rate for a regulated criteria pollutant is above exemption thresholds and permitting allowables are below Title V thresholds, and/or 3) issued to sources whose potential to emit for a toxic pollutant is above state toxic exemption thresholds and permitting allowables are below Title V thresholds. The minor NSR permit can be used to establish synthetic minor limits for avoidance of state major, PSD and/or Title V permits. For purposes of fees, the Minor NSR permit also includes exemption applications and applications for projects at existing sources.

Minor NSR amendment - A change to a permit issued pursuant to Article 6 (9 VAC 5-80-1100 et seq.) of 9 VAC 5 Chapter 80. Only minor amendments and significant amendments are included in this category.

Sources subject to Synthetic Minor permitting requirements - Stationary sources whose potential to emit exceeds the Title V threshold (100 tons per year of a criteria pollutant, 10/25 tpy of HAPs, and/or 100,000 tpy CO_2e) but have taken federally enforceable limits, either through a state operating permit or a minor NSR permit, to avoid Title V permit applicability.

Sources subject to Title V permitting requirements – Stationary sources that have a potential to emit above the Title V thresholds or are otherwise applicable to the Title V permitting program.

State major permit – A permit to construct and operate issued under Article 6 (9 VAC 5-80-1100 et seq.) of 9 VAC 5 Chapter 80. State major permits are for facilities that have an allowable emission rate of more than 100 tons per year, but less than 250 tons per year, of any criteria pollutant and are not listed in the 28 categories under "major stationary source" as defined in 9 VAC 5-80-1615.

State operating permit (SOP) – A permit issued under Article 5 (9 VAC 5-80-800 et seq.) of 9 VAC 5 Chapter 80. SOPs are most often used by stationary sources to establish federally enforceable limits on potential to emit to avoid major New Source Review permitting (PSD and Nonattainment permits), Title V permitting, and/or major source MACT applicability. SOPs can also be used to combine multiple permits from a stationary source into one permit or to implement emissions trading requirements. The State Air Pollution Control Board, at its discretion, may also issue SOPs to cap the emissions of a stationary source or emissions unit causing or contributing to a violation of any air quality standard or to establish a source-specific emission standard or other requirement necessary to implement the federal Clean Air Act or the Virginia Air Pollution Control Law.

SOP permit amendment - A change to a permit issued pursuant to Article 5 (9 VAC 5-80-800 et seq.) of 9 VAC 5 Chapter 80. Only minor amendments and significant amendments are included in this category.

Title V permit – A federal operating permit issued pursuant to Article 1 (9 VAC 5-80-50 et seq.) or Article 3 (9 VAC 5-80-360 et seq.) of 9 VAC 5 Chapter 80. Facilities which (1) have the potential to emit of air pollutants above the major source thresholds, listed in 9 VAC 5-80-60 OR (2) are area sources of hazardous air pollutants, not explicitly exempted by EPA OR (3) have the potential to emit over 100,000 tons per year of CO_2 equivalent (CO_2e) (9 VAC 5-85 Part III), are required to obtain a Title V permit. For purposes of fees, the Title V permit also includes Acid Rain (Article 3) permit applications.

Title V permit modification - A change to a permit issued pursuant to Article 1 (9 VAC 5-80-50 et seq.) or Article 3 (9 VAC 5-80-360 et seq.) of 9 VAC 5 Chapter 80. Only minor modifications and significant modifications are included in this category.

Title V permit renewal – A renewal of a Title V permit pursuant to Article 1 (9 VAC 5-80-50 et seq.) of 9 VAC 5 Chapter 80. Title V permits are renewed every 5 years and a renewal application must be submitted to the regional office no sooner than 18 months and no later than 6 months prior to expiration of the Title V permit. For purposes of fees, the Title V permit renewal also includes Acid Rain (Article 3) permit renewal applications.

True minor source – A source that does not have the physical or operational capacity to emit major amounts (even if the source owner and regulatory agency disregard any enforceable limits). For further information, click here.

AIR PERMIT APPLICATION
CHECK ALL PAGES ATTACHED AND LIST ALL ATTACHED DOCUMENTS

- _X_ Local Government Certification Form, Page 3
- _X_ Application Fee Form, Pages 4-6
- _X_ Document Certification Form, Page 7
- _X_ General Information, Pages 8-9
- _X_ Fuel Burning Equipment, Page 10
- _X_ Stationary Internal Combustion Engines, Page 11
- ___ Incinerators, Page 12
- _X_ Processing, Page 13
- ___ Inks, Coatings, Stains, and Adhesives, Page 14
- _X_ VOC/Petroleum Storage Tanks, Pages 15-16
- ___ Loading Rack and Oil-Water Separators, Page 17
- ___ Fumigation Operations, Page 18
- _X_ Air Pollution Control and Monitoring Equipment, Page 19
- ___ Air Pollution Control/Supplemental Information, Page 20
- _X_ Stack Parameters and Fuel Data, Page 21
- _X_ Proposed Permit Limits for Criteria Pollutants, Page 22
- _X_ Proposed Permit Limits for Toxic Pollutants/HAPs, Page 23
- _X_ Proposed Permit Limits for Other Reg. Pollutants, Page 24
- _X_ Proposed Permit Limits for GHGs on Mass Basis, Page 25
- _X_ Proposed Permit Limits for GHGs on CO_2e Basis, Page 26
- ___ BAE for Criteria Pollutants, Page 27
- ___ BAE for GHGs on Mass Basis, Page 28
- ___ BAE for GHGs on CO_2e Basis, Page 29
- _X_ Operating Periods, Page 30

___ <u>ATTACHED DOCUMENTS:</u>

- ___ Map of Site Location
- _X_ Facility Site Plan
- ___ Process Flow Diagram/Schematic
- ___ MSDS or CPDS Sheets
- _X_ Estimated Emission Calculations
- ___ Stack Tests
- ___ Air Modeling Data
- ___ Confidential Information (see Instructions)
- _X_ BACT Analysis

Check added form sheets above; also indicate the number of copies of each form in blank provided.

DOCUMENT CERTIFICATION FORM

I certify under penalty of law that this document and all attachments [as noted above] were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering and evaluating the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I certify that I understand that the existence of a permit under [Article 6 of the Regulations] does not shield the source from potential enforcement of any regulation of the board governing the major NSR program and does not relieve the source of the responsibility to comply with any applicable provision of the major NSR regulations.

SIGNATURE:	[signature]	DATE:	6-17-2016
NAME:	Anand Gangadharan	REGISTRATION NO:	TBD
TITLE:	Authorized Signatory	COMPANY:	C4GT, LLC
PHONE:	248-735-6684	ADDRESS:	23955 Novi Road
EMAIL:	agangadh@novienergy.com		Novi, MI 48375

References: <u>Virginia Regulations for the Control and Abatement of Air Pollution (Regulations)</u>, 9 VAC 5-20-230B and 9 VAC 5-80-1140E.